

Support for claim terminology “a packing material therein” may be found on page 50 lines 21-30, page 44, line 29 and shown in Figure 7.

Support for claim terminology “a secondary chamber having a diameter smaller than the diameter of the first chamber” and “second scrubbing chamber has a diameter about one-fifth the diameter of the first scrubbing chamber” may be found on page 47, lines 4-10.

Support for claim terminology “without a caustic reagent” may be found on page 20, lines 9-10 and page 28, line 20.

Support for claim terminology “neutral water” may be found on page 32, line 28.

Affirmation of Prior Election of Invention and Cancellation of Claims Withdrawn by Examiner

Applicants hereby affirm cancellation of claims 1-20, 30-33, and 50. Such cancellation is with the express reservation of the right to file a divisional application directed to the subject matter thereof, during the pendency of the present application, or during the pendency of a further divisional or continuing application based on and claiming priority of the present invention.

The claims pending in the application are 21-29, 34-49, and 51-66.

Rejection of Claims and Traversal Thereof

In the November 7, 2000 Office Action:

claims 26-27 were rejected under 35 U.S.C. §112, second paragraph;

claim 21 was rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,147,756 issued to Dahlstrom et al.;

claims 21 and 26 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,405,590 issued to Macedo et al.;

claim 21, 26-27 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,147,756 issued to Dahlstrom et al.; and

claims 21, 26-27 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,405,590 issued to Macedo et al.

These rejections are hereby traversed in respect of the pending claims 21, 26-27 as amended herein.

Reconsideration of the patentability of the pending claims is therefore requested in light of the following remarks.

Rejection under 35 U.S.C. § 112, second paragraph

Applicant has amended independent claim 26 to obviate the rejection of claims 26-27. Accordingly, applicants respectfully submit that the claims now satisfy the requirements under 35 U.S.C. 112, second paragraph. Withdrawal of this rejection is respectfully requested.

Rejection under 35 U.S.C. 102(b)

Claim 21 was rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,147,756 issued to Dahlstrom et al, and claims 21 and 26 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,405,590 issued to Macedo et al. Applicants respectfully traverse. Claims 21 and 26, as amended, recite a first and second scrubber chamber wherein the second scrubber chamber has a smaller volume than the first scrubber chamber. Neither Dahlstrom et al. nor Macedo et al. disclose a second scrubbing unit having a smaller volume than the first scrubbing unit. Viewing Figure 1 of the Dahlstrom et al. reference and Figure 1 of the Macedo et al. reference as the only relevant disclosure, in the absence of any textual description, the second scrubbing unit shown in each of such references **is as large or larger than the first scrubbing unit**. Thus, the scrubbing systems recited in claims 21 and 26 are not anticipated by Dahlstrom et al. or Macedo et al. Reconsideration and withdrawal of the rejections is respectfully requested.

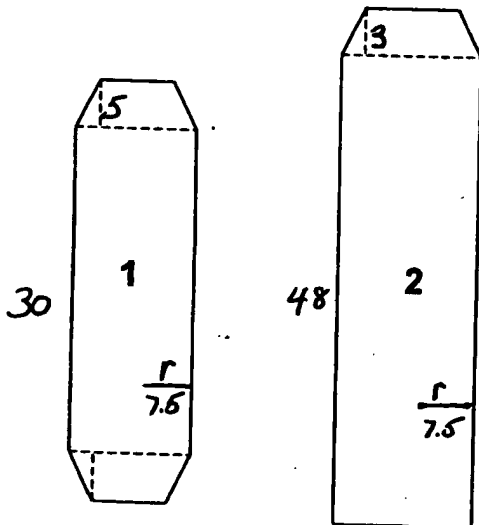
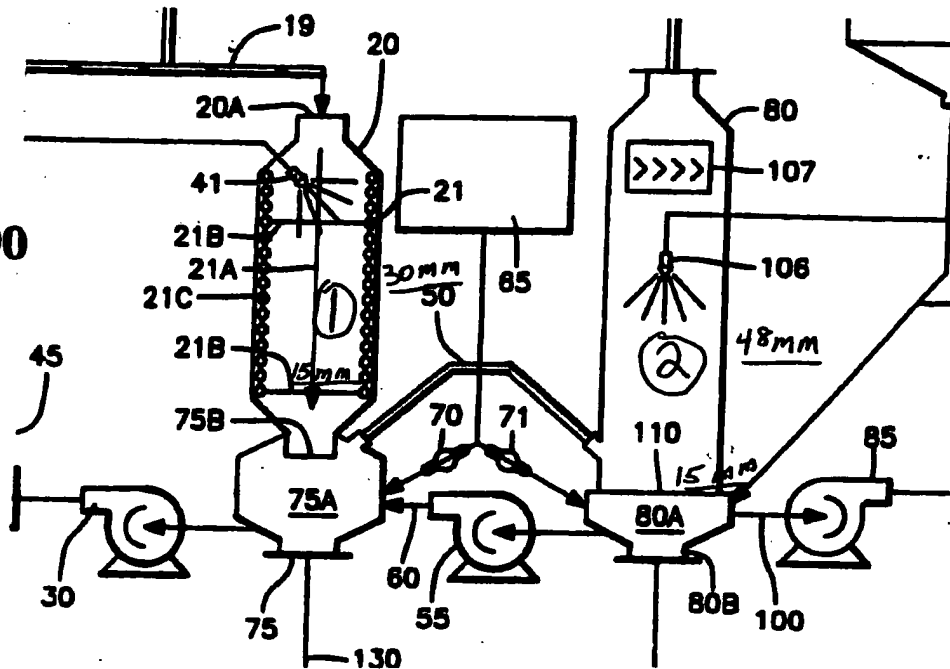
Rejection under 35 U.S.C. 103(a)

Claims 21, 26-27 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,147,756 issued to Dahlstrom et al. or U.S. Patent No. 5,405,590 issued to Macedo et al. Applicants respectfully traverse these rejections and submit that neither Dahlstrom et al. nor Macedo et al. render Applicants' claimed invention as *prima facie* obvious.

Prior to a discussion of the cited references, it is instructive to consider applicants' claimed invention. Specifically the invention relates to an abatement system that comprises a first scrubbing unit wherein the effluent gas is flowed co-currently with a scrubbing liquid to remove gases and solids. From the first stage scrubber unit, the partially treated gas flows to a second stage scrubber unit. The second scrubbing unit is smaller than the first stage scrubber unit. The smaller size enables proper wetting with a lower water flow rate. Most preferably, the diameter of the second scrubbing unit is about one fifth the diameter of the first scrubbing unit. Further, the efficiency of the two stage scrubber is high and allows the system to operate without using chemical injection agents such as a caustic agent and/or large amounts of fresh water.

In contrast, Dahlstrom et al. and Macedo et al. both disclose a two-stage scrubber system having a second scrubbing unit that is as large or larger than the first scrubbing unit. As stated above, Figure 1 of the Dahlstrom et al. and Figure 1 of the Macedo et al reference, both show a second scrubbing unit that is as large or larger than the first scrubbing unit. Applicants have performed simple volume calculations using the diameters (in millimeters) of the cylindrical vessels of the scrubbing systems shown in Figure 1 of both cited prior reference. As shown below, the volumes of the secondary scrubbing units in both the Dahlstrom et al. and Macedo et al. scrubbing systems are larger than the first scrubbing units. Further, the diameters of the secondary vessels are as large or larger than the first scrubbing units. Specifically, the Dahlstrom et al (U.S. Pat. 5,405,590) secondary unit shows a volume about one third larger and with a diameter as large as the first scrubbing unit. Likewise, the secondary unit of Macedo et al. (U.S. Pat. 4,147,756) is about four times larger and with a diameter about twice that of the first scrubbing unit.

5,405,590



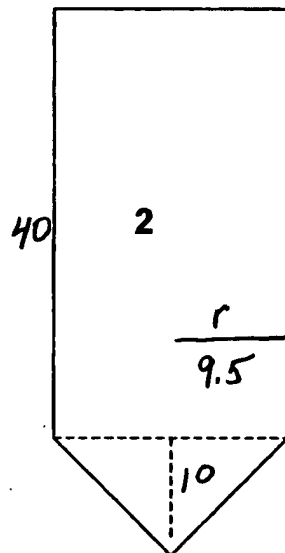
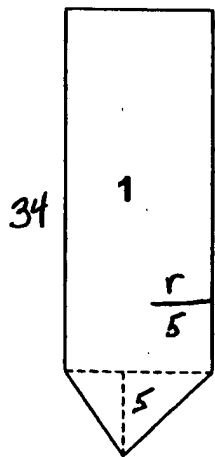
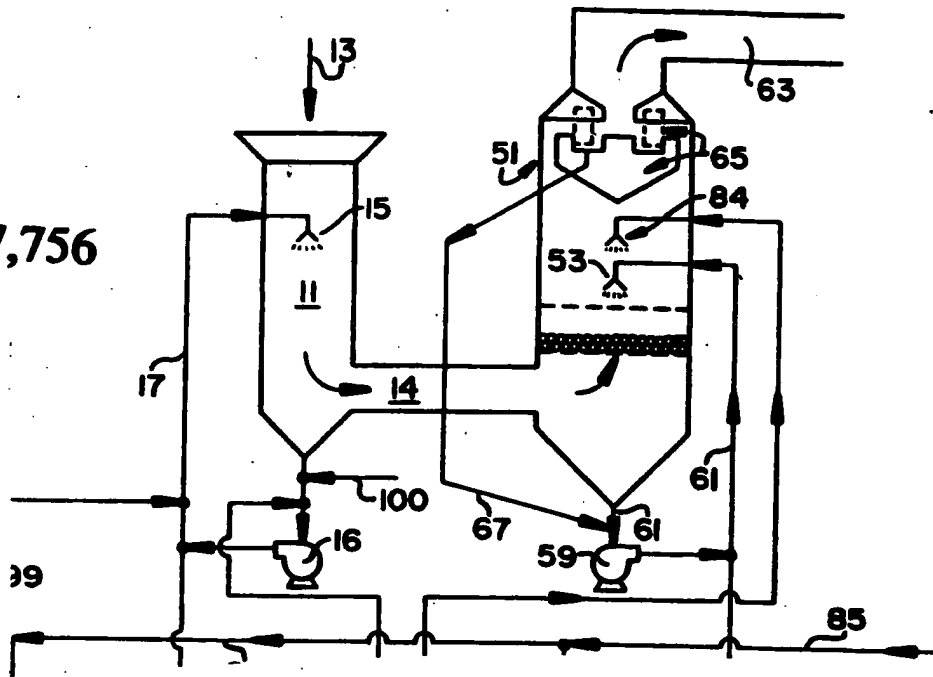
Assumption: Vessels are cylindrical with cone shaped extensions

$$\text{Volume of Vessel 1} = \pi r^2 h + 2 \left(\frac{1}{3} \pi r^2 h \right) = \pi (7.5\text{mm})^2 30\text{mm} + 2 \left(\frac{1}{3} \pi (7.5\text{mm})^2 5\text{mm} \right) = 5301.4 \text{ mm}^3$$

$$\text{Volume of Vessel 2} = \pi r^2 h + \left(\frac{1}{3} \pi r^2 h \right) = \pi (7.5\text{mm})^2 48\text{mm} + \left(\frac{1}{3} \pi (7.5\text{mm})^2 3\text{mm} \right) = 8662.0 \text{ mm}^3$$

Thus, the volume of Vessel 2 is about 1/3 larger than the volume of Vessel 1 and the diameter of Vessel 2 is as large as the diameter of Vessel 1

4,147,756



Assumption: Vessels are cylindrical with cone shaped extensions

$$\begin{aligned} \text{Volume of Vessel 1} &= \pi r^2 h + (1/3 \pi r^2 h) = \\ &= \pi (5\text{mm})^2 34\text{mm} + (1/3 \pi (5\text{mm})^2 5\text{mm}) = \\ &= 2800 \text{ mm}^3 \end{aligned}$$

$$\begin{aligned} \text{Volume of Vessel 2} &= \pi r^2 h + (1/3 \pi r^2 h) = \\ &= \pi (9.5\text{mm})^2 40\text{mm} + (1/3 \pi (9.5\text{mm})^2 10\text{mm}) = \\ &= 12,286.1 \text{ mm}^3 \end{aligned}$$

Thus, the volume of Vessel 2 is about 4 times greater than the volume of Vessel 1 and the diameter of Vessel 2 is about 2 times larger than the diameter of Vessel 1

Thus, neither reference discloses, teaches or suggests the use of a smaller secondary scrubbing unit to increase efficiency and reduce the need for large amounts of make-up water. Instead, the scrubbing systems of Dahlstrom et al. and Macedo et al. are oversized and require excessive scrubbing liquid in relation to applicants' claimed invention.

The Office has failed to give weight to the advantages and benefits of the present invention as part of the “invention as a whole” and cites references that do not disclose or teach such advantages or benefits. For instance Macedo et al. provides no information on the advantages of a smaller diameter scrubbing unit with the concomitant reduction in water consumption and increased efficiency per liter of water. Instead, Macedo et al. discusses redirecting fluid from one scrubber to another. Additionally, Macedo et al. discloses the reduction of temperatures in the secondary scrubber to cause condensation and reduce evaporation. (See column 3, lines 8-15) to increase water content between the scrubber units. Clearly, there is no discussion regarding the size of either scrubbing vessel. Likewise, Dahlstrom et al. describes the redirection of fluids between scrubbing units after the addition of a neutralizing agent. Again, the size of the scrubbing vessels is not addressed. Obviously, the benefits of a smaller secondary unit having a substantially reduced diameter, e.g., about one fifth that of the first scrubber unit is not described, discussed or taught by either cited reference. As stated above, the scrubbing systems of Dahlstrom et al. and Macedo et al. are overdesigned and required excessive scrubbing liquid in relations to applicants’ claimed invention.

The Office admits that the prior art does not disclose a second scrubbing unit that is smaller than the first scrubbing unit. However, the Office contends that both cited references teach a two stage scrubbing system and that it would have been obvious to one having ordinary skill in the art to optimize the size of the scrubber units to obtain the best results. Applicants disagree because the cited references have provided no guidance as to which parameters are critical and have given no direction as to which of the many choices of different sizes is likely to be successful.

It is incumbent on the Office to provide some suggestion or teaching in the prior art that would lead one skilled in the art to proceed in the direction of applicant’s claimed invention. Applicants submit that the Office has not provided objective or specific teachings or suggestions in the cited prior art to motivate one skilled to modify said references. Moreover, what is the asserted motivation put forth in either reference to reduce the size of the second scrubber unit. Neither reference discusses the importance of minimizing the overall volume of the secondary chamber. The Courts have addressed this issue numerous times and have stated “The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification” *In re Mills*, 16 USPQ2d 1430 (Fed. Cir. 1990) quoting *In re Gordon* 221 USPQ 1125 (Fed. Cir. 1984). It is further stated by the *Mills* Court that “It is not pertinent whether the prior art possesses the functional characteristics of the claimed

invention if the reference does not describe or suggest its structure.” Thus, this allegedly "obvious" maneuver is supported only by the Office's reinterpretation of the art in light of applicants' disclosure.

The Office appears to argue that it would be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognizes that particular parameters affect the result. As the Courts have said several times “obvious to try” is not the standard of 35 U.S.C §103. *In re Tomlinson*, 150 USPQ 623 (CCPA 1966)

The controlling question is whether the difference between the cited prior art and applicants' invention as a whole would have been obvious. Applicants argue that it is impossible to recognize by the teachings of the prior art that a specific volume of the second scrubbing unit is necessary to maximize the effectiveness of the scrubbing system. **Initially, it is essential to recognize the importance of reducing the size of the second chamber before the obviousness of conducting experiments to determine the correct size ratio to maximize treatment capacity is even considered.** Determining the optimum volume size of the second scrubbing unit in relation to the first scrubbing unit can only be determined from data representing varying tank volume, fixed throughput, fixed contact area, varying throughput and the like. These types of experiments are not suggested by the teachings of the prior art because neither reference recognizes the problem that applicants are overcoming by reducing the size of the scrubbing chamber to reduce water input while increasing efficiency of the process. Thus, the size of the second scrubbing chamber in relation to the first scrubbing chamber is not recognized by the prior art to be a result-effective variable, and as such, the direction taken by applicants is not obvious.

Also, applicants have discovered that effective abatement can be accomplished with a neutral water scrubbing liquid without the addition of precipitating reagents, such as sodium hydroxide, to the scrubbing liquids. In contrast, both cited references describe the requirement of adding a precipitating reagent to at least one of the scrubbing liquids. For example, Macedo et al. describes the use of sodium hydroxide in the first scrubbing liquid for neutralizing acidic contaminants in the exhaust stream. (See column 2, lines 33-35) Likewise, Dahlstrom et al. describes the addition of a sodium-base reagent in the secondary scrubbing system wherein sodium hydroxide may be present in various degrees. (See column 5, lines 17-39)

Accordingly, for reasons set forth above applicants contend that the Office has not met its burden of establishing a *prima facie* case of obviousness. Thus, applicants respectfully request that the rejection of claims 21, 26-27 on the basis of obviousness, be withdrawn.



FEES PAYABLE

Applicants have added additional claims 51-66 but because claims 1-20, 30-33, and 50 were cancelled due to a restriction requirement no addition fees are due for the additional claims as set forth below.

CLAIMS AS AMENDED						
(1)	(2) Claims Remaining After Amendment	(3)	(4) Highest Number Previously Paid for	(5) No. of Extra Claims Present	(6) Rate	(7) Additional Fees
Total Claims	* 19	Minus	** 50	0	x \$ 18.00	= \$ 0.00
Indep. Claims	*3	Minus	**19	0	x \$ 40.00	= \$ 0.00
Total Additional Fee For This Amendment						\$0.00

Conclusion

The pending claims, as now amended, patentably distinguish over the prior art, and in view of the forgoing remarks, it is respectfully requested that all rejections be withdrawn thereby placing the application in condition for allowance. Notice of the same is earnestly solicited. In the event that any issues remain, Examiner Nguyen is requested to contact the undersigned attorney at (919) 419-9350 to resolve same.

Respectfully submitted

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